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(54) **IC CARD**

IC-KARTE

CARTE A CIRCUIT INTEGRE

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## Description

### Technical Field

[0001] The present invention relates to an IC card used as various cards such as a cash card or a credit card and, more particularly, to an IC card in which an IC module mounted on the IC card is reinforced, according to the preamble of claim 1.

### Background Art

[0002] In an IC card used as various cards, precious data are stored. For this reason, an IC module mounted on the IC card also requires reliability.

[0003] A conventional IC module, as shown in FIG. 8, is constituted by a terminal plate 1 in which connection terminal patterns 3 for external power supply, signal connection, and grounding are arranged on one surface of an insulating substrate 2, an IC chip 4 arranged on the rear surface of the terminal plate 1, bonding wires 15 for electrically connecting pad portions of the IC chip 4 to the rear surfaces of the connection terminal patterns 3 through holes 16 of the insulating substrate 2, and a sealing member 5, consisting of an insulating resin, for protecting the IC chip 4 and the bonding wires 15.

[0004] In using, keeping, or the like of IC cards, the IC cards tend to be very easily influenced by external force such as bending or impact. For this reason, external force also acts on the IC modules not to prevent accidents that the IC modules are damaged.

[0005] Therefore, in a prior art, as shown in FIG. 9, a ringshaped reinforcing member 60, consisting of a hard material such as a metal or ceramic, for reinforcing the sealing member 5 is attached, and external force is received by the reinforcing member 60 to make a device for preventing damage of an IC module. However, even in this structure, damage caused by external force cannot be sufficiently prevented.

[0006] More specifically, two types of manners are mainly known as damage manners of an IC module. One is caused by cracking of the IC chip 4, and the other is caused by disconnection of the bonding wires 15 due to peeling between the insulating substrate 2 and the sealing member 5 as shown in FIG. 10.

[0007] In this case, an IC module in which a conventional ringshaped reinforcing member 60 shown in FIG. 9 is provided is sufficiently effective in reinforcement for the cracking of the IC chip 4. However, this IC module is not sufficiently effective in preventing disconnection of the bonding wires 15 caused by the latter peeling between the insulating substrate 2 and the sealing member 5 because prevention of peeling depends on the adhesive strength between the reinforcing member 60 and the insulating substrate 2 only by an adhesive agent 13 and because the adhesive strength depends on the strength of the insulating substrate 2 itself.

[0008] In other words, when external force shown in

FIG. 10 acts on the terminal plate 1, the insulating substrate 2 is relatively easily peeled from the reinforcing member 60. For this reason, not only the sealing member 5 but also the bonding wires 15 are disadvantageously disconnected.

[0009] An IC-card with the features of the preamble of claim 1 is known from US 5,581,445. The extensive size of the reinforcing member now makes the reinforcing member with its embedded IC-module subject to be peeled of in its entirety.

[0010] A further similar IC-card is shown in JP-1040397 showing a housing body to absorb the stress to a substrate for preventing the stress from directly acting on an IC module.

[0011] The present invention has been made in consideration of the above circumstances, and has as its object to provide a low-cost IC card which can prevent disconnection of a bonding wire caused by peeling between an insulating substrate and a sealing member by external force and which is strong as a whole card and at the same time protect the IC card against electrostatic discharges.

### Disclosure of Invention

[0012] In order to achieve the above object, according to the present invention, an IC card is provided with the features of claim 1. Further embodiments are subject of claims 2-10.

[0013] According to the IC card with the above arrangement, the reinforcing member constituted by the ring portion and the flange portion receives external force acting between the insulating substrate and the sealing member. For this reason, the reinforcing member prevents the insulating substrate from being peeled from the sealing member to prevent disconnection of the bonding wire caused by the peeling. As a result, a highly reliable IC card in which an accident that an IC module is damaged rarely occurs can be provided. Additionally, the reinforcing member is constituted by a conductive member, and is electrically connected to the grounding connection terminal pattern.

[0014] According to the IC card with the arrangement, since the reinforcing member can be mass-produced, a low-cost IC card can be provided.

### Brief Description of Drawings

[0015] FIG. 1 is a plan view of an IC module of an IC card according to an embodiment of the present invention when viewed from the mounting side of an IC chip. FIG. 2 is an A - A sectional view of the IC module shown in FIG. 1. FIG. 3 is a B - B sectional view of the IC module shown in FIG. 1. FIG. 4 is a plan view of the IC module shown in FIG. 1 when viewed from a connection terminal pattern side. FIG. 5 is a sectional view showing deformation of the IC module shown in FIG. 1 caused by external force. FIG. 6 is a sectional view of an IC card on

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which the IC module shown in FIG. 1 is mounted. FIG. 7 is a sectional view of an IC module according to another embodiment of the present invention. FIG. 8 is a sectional view of a conventional IC module. FIG. 9 is a sectional view of an IC module with a conventional reinforcing member. FIG. 10 is a sectional view showing a peeling state of the IC module with the conventional reinforcing member caused by external force.

### Best Mode for Carrying Out the Invention

[0016] Embodiments of the present invention will be described below with reference to the drawings.

[0017] The same reference numerals as in the drawings to be referred to denote the same parts shown in FIG. 9 or FIG. 10, to omit the explanations.

[0018] As shown in FIG. 1 and FIG. 2, an IC module according to this embodiment has a terminal plate 1 in which connection terminal patterns 3 are arranged on one surface of an insulating substrate 2, an IC chip 4 arranged on the rear surface of the terminal plate 1 and sealed by the sealing member 5, and bonding wires 15 for electrically connecting pad portions of the IC chip 4 to the rear surfaces of the connection terminal patterns 3 through holes 16 of the insulating substrate 2.

[0019] The reinforcing member 6 consists of a conductive material, and is integrally constituted by a ring portion 7 for covering the outer periphery of the sealing member 5 and a flange portion 8 for covering the insulating substrate 2. The shape of the outer periphery of the flange portion 8 has the same shape as that of the outer periphery of the terminal plate 1. The flange portion 8 is adhered to the insulating substrate 2 of the terminal plate 1 with an adhesive agent 13.

[0020] As shown in FIG. 3, the insulating substrate 2 has a through hole 10 at a position corresponding to a grounding connection terminal pattern 9. The reinforcing member 6 has a projection portion 11 projecting toward the insulating substrate 2. The projection portion 11 is fitted in the through hole 10 to position the reinforcing member 6.

[0021] The reinforcing member 6 is electrically connected to the grounding connection terminal pattern 9 through the projection portions 11 and a conductive member 17 such as a conductive adhesive agent. In this manner, the IC is not damaged by electrostatic discharging from a capacitor formed by the terminal pattern 9 and the reinforcing member 6, and a shield effect can be expected.

[0022] The ring portion 7 of the reinforcing member 6, as shown in FIG. 1 and FIG. 2, has a reinforcing rib 12 located above the IC chip 4 to improve the strength of the reinforcing member 6 and to protect the IC chip 4 from impacting external force. In the flange portion 8, a plurality of window holes 14 constitute adhesive agent puddles. The adhesive agent 13 escapes from the window hole 14 to decrease the thickness of the adhesive agent layer, thereby improving the adhesive strength.

[0023] With this arrangement, external force P acting in the direction of an arrow in FIG. 5 is received by the reinforcing member 6. For this reason, the insulating substrate 2 is not peeled from the sealing member 5. As a result, a strong IC card structure which is not damaged by disconnection of the bonding wire 15 is obtained.

[0024] The reinforcing member 6 according to this embodiment is obtained by forming the various holes and the outer shape by trimming after drawing of a metal plate, and is manufactured by press working using progressive dies. For this reason, the parts cost of the reinforcing member 6 is low.

[0025] In mounting the IC module on a card base 18 for completing an IC card, as shown in FIG. 6, the IC module is engaged with a module mounting recessed portion 18a formed in the card base 18. The IC module is adhesively fixed to the recessed portion 18a of the card base 18 with an adhesive agent coated on the flange portion 8 of the reinforcing member 6. In this case, since an excessive part of the adhesive agent between the flange portion 8 and the recessed portion 18a of the card base 18 escapes from the window hole 14 of the adhesive agent puddle, a thin adhesive agent layer is formed to improve the adhesive force.

[0026] The reinforcing member 6 can also be manufactured by forging or casting. In this case, a reinforcing member 6 shown in FIG. 7 is obtained.

[0027] As has been described above, according to the present invention, since the resistance of the IC module to external force can be improved, an accident that the IC module is damaged by disconnection of a bonding wire caused by peeling between an insulating substrate and a sealing member can be prevented, and a highly reliable IC card can be provided. In addition, since the IC module can be fixedly mounted on the card base, the whole of the IC card can be made solid.

### Industrial Applicability

[0028] The present invention is suitably used, as an IC card having a reinforced IC module mounted on the card, in various cards such as a cash card or a credit card.

### Claims

1. An IC card in which an IC module is mounted on a card base (18) and including

- a terminal plate (1) arranged on a surface of an insulating substrate (2),
- an IC chip (4) mounted on a rear surface of the terminal plate (1) and electrically coupled to the connection terminal pattern (3,9),
- a sealing member (5) for the IC chip (4), and
- a reinforcing member (6) for reinforcing the sealing member (5)

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- wherein said terminal plate (1) having a connection terminal pattern (3,9) for external power supply, signal connection, and grounding, and
- wherein the reinforcing member (6) is integrally constituted by at least a ring portion (7) for covering the outer periphery of the sealing member (5) and a flange portion (8) for covering the rear surface of the insulating substrate (2),

characterized in that the reinforcing member (6) is constituted by a conductive member and is electrically connected to the grounding connection terminal pattern (9).

2. The IC card according to claim 1, characterized in that the insulating substrate (2) has a through hole (10) formed at a position corresponding to the grounding connection terminal pattern (9), the reinforcing member (6) has a projection portion (11) projecting toward the insulating substrate (2), the projection portion (11) is fitted in the through hole (10) to position the reinforcing member (6).
3. The IC card according to claim 1 or 2, characterized in that the ring portion (7) of the reinforcing member (6) has a reinforcing rib (12) located above the IC chip (4).
4. The IC card according to any one of claims 1, 2, or 3, characterized in that the outer periphery of the flange portion (8) of the reinforcing member (6) has substantially the same shape as the outer periphery of the terminal plate (1).
5. The IC card according to any one of claims 1 to 4, characterized in that the flange portion (8) is adhered to the insulating substrate (2) with an adhesive agent (13).
6. The IC card according to any one of claims 1 to 5, characterized in that the flange portion (8) is adhered to a card base (18) with an adhesive agent (13).
7. The IC card according to claim 5 or 6, characterized in that the flange portion (8) comprises a plurality of window holes (14) for forming escape portions for an excessive adhesive agent (13).
8. The IC card according to any one of claims 1 to 7, characterized in that the reinforcing member (6) is manufactured by drawing of a thin plate.
9. The IC card according to any one of claims 1 to 7, characterized in that the reinforcing member (6) is manufactured by forging.

10. The IC card according to any one of claims 1 to 7, characterized in that the reinforcing member (6) is manufactured by casting.

#### Patentansprüche

1. Integrierte Schaltkreis-Karte, in welcher ein Integriertes-Schaltkreis-Modul auf einer Karten-Basis (18) aufgebaut ist und umfasst

- eine Anschluss-Platte (1), welche auf einer Oberfläche eines isolierenden Substrats (2) angeordnet ist,
- einen Integrierten-Schaltkreis-Chip (4), der auf einer Rückfläche der Anschluss-Platte (1) angeordnet und elektrisch mit dem Verbindungsanschluss-Muster (3,9) verbunden ist,
- einem Abdicht-Element (5) für den Integrierten-Schaltkreis-Chip (4), und
- einem Verstärkungs-Element (6) zum Verstärken des Abdicht-Elementes (5),

- wobei die besagte Anschlussplatte (1) ein Verbindungsanschluss-Muster (3,9) für die externe Stromversorgung, die Signalverbindung und das Erden hat, und
- wobei das Verstärkungs-Element (6) in integrierter Weise durch mindestens einen Ring-Abschnitt (7) zur Abdeckung des äusseren Umkreises des Abdicht-Elementes (5) und eines Flansch-Abschnittes (8) zur Abdeckung der Rückfläche des isolierenden Substrats (2) ausgebildet ist,

dadurch gekennzeichnet, dass das Verstärkungs-Element (6) durch ein leitendes Element ausgebildet ist und in elektrischer Weise mit dem erdenden Verbindungsanschluss-Muster (9) verbunden ist.

2. Integrierte Schaltkreis-Karte gemäss Anspruch 1, dadurch gekennzeichnet, dass das isolierende Substrat (2) ein Durchgangsloch (10) aufweist, welches an einer Position ausgebildet ist, die dem erdenden Verbindungsanschluss-Muster (9) entspricht, wobei das Verstärkungs-Element (6) einen Ansatz-Abschnitt (11) aufweist, der sich auf das isolierende Substrat (2) hin erstreckt, wobei der Ansatz-Abschnitt (11) durch das Durchgangsloch (10) einsetzbar ist, um das Verstärkungs-Element (6) zu positionieren.
3. Integrierte Schaltkreis-Karte gemäss Anspruch 1 oder 2, dadurch gekennzeichnet, dass der Ring-Abschnitt (7) des Verstärkungs-Elementes (6) eine Verstärkungsrippe (12) hat, die oberhalb des integrierten Schaltkreis-Chips (4) angeordnet ist.

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4. Integrierte Schaltkreis-Karte nach einem der Ansprüche 1, 2 oder 3, **dadurch gekennzeichnet, dass** der äussere Umkreis des Flansch-Abschnittes (8) des Verstärkungs-Elementes (6) im Wesentlichen die gleiche Form wie der äussere Umkreis der Anschlussplatte (1) aufweist. 5
5. Integrierte Schaltkreis-Karte gemäss einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Flansch-Abschnitt (8) mit einem Klebe-Agens (13) an dem isolierenden Substrat (2) angeklebt ist. 10
6. Integrierte Schaltkreis-Karte gemäss einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** der Flansch-Abschnitt (8) mit einem Klebe-Agens (13) an einer Kartenbasis (18) angeklebt ist. 15
7. Integrierte Schaltkreis-Karte nach Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** der Flansch-Abschnitt (8) eine Vielzahl von Fensterlöchern (14) zur Ausbildung von Entweich-Abschnitten für einen überschüssigen Klebe-Agens aufweist. 20
8. Integrierte Schaltkreis-Karte nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** das Verstärkungs-Element (6) durch das Ziehen einer dünnen Platte hergestellt worden ist. 25
9. Integrierte Schaltkreis-Karte nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** das verstärkungs-Element (6) durch Schweiessen hergestellt worden ist. 30
10. Integrierte Schaltkreis-Karte nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** das verstärkungs-Element (6) durch Giessen hergestellt worden ist. 35

#### Revendications

1. Carte à circuit intégré, dans laquelle un module de circuit intégré est monté sur une base de carte (18), et qui comprend; 40
  - une plaque de connexion (1), arrangée sur la surface d'un substrat isolant (2);
  - un chip de circuit intégré (4), monté sur la surface arrière de la plaque de connexion (1) et accouplé d'une manière électrique à un dessin de connexion (3, 9); 50
  - un élément d'étanchéité (5) pour le chip à circuit intégré (4), et;
  - un élément de renforcement (6) pour renforcer l'élément d'étanchéité (5); 55
- où la plaque de connexion (1) comprend un dessin de connexion (3, 9) pour une ali-

mentation externe, la connexion de signaux et la mise à terre, et

- où l'élément de renforcement (6) est constitué d'une manière intégrale par au moins une portion annulaire (7) pour recouvrir la périphérie extérieure de l'élément d'étanchéité (5) et une portion de bride (8) pour recouvrir la surface arrière du substrat isolant (2).

**caractérisé en ce que** l'élément de renforcement (6) est constitué par un membre conducteur et est connecté électriquement au dessin de connexion de mise à terre (9).

2. Carte à circuit intégré selon la revendication 1, **caractérisé en ce que** le substrat isolant (2) possède un trou de passage (10) formé à la position qui correspond au dessin de connexion de mise à terre (9), où l'élément de renforcement (6) comprend une portion de prolongement (11), qui s'étend envers le substrat isolant (2), où la portion de prolongement (11) s'engage dans le trou de passage (10) pour positionner l'élément de renforcement (6).
3. Carte à circuit intégré selon la revendication 1 où 2, **caractérisé en ce que** la portion annulaire (7) de l'élément de renforcement (6) comprend une côte de renforcement (12), localisée au-dessus du chip à circuit intégré (4).
4. Carte à circuit intégré selon l'une quelconque des revendications 1, 2, où 3, **caractérisé en ce que** la périphérie extérieure de la portion de bride (8) de l'élément de renforcement (6) a essentiellement la même forme que la périphérie extérieure de la plaque de connexion (1).
5. Carte à circuit intégré selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** la portion de bride (8) adhère au substrat isolant (2) avec un agent adhésif (13).
6. Carte à circuit intégré selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** la portion de bride (8) adhère à une base de carte (18) avec un agent adhésif (13).
7. Carte à circuit intégré suivant les revendications 5 où 6, **caractérisé en ce que** la portion de bride (8) comprend une pluralité de trous à fenêtre (14), pour former des portions de fuite pour des quantités excessives de l'agent adhésif.
8. Carte à circuit intégré selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** l'élément de renforcement (6) est produit par tirage d'une plate mince.

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9. Carte à circuit intégré selon l'une quelconque des revendications 1 à 7, caractérisé en ce que l'élément de renforcement (6) est produit par soudure.

10. Carte à circuit intégré selon l'une quelconque des revendications 1 à 7, caractérisé en ce que l'élément de renforcement (6) est produit par moulage.

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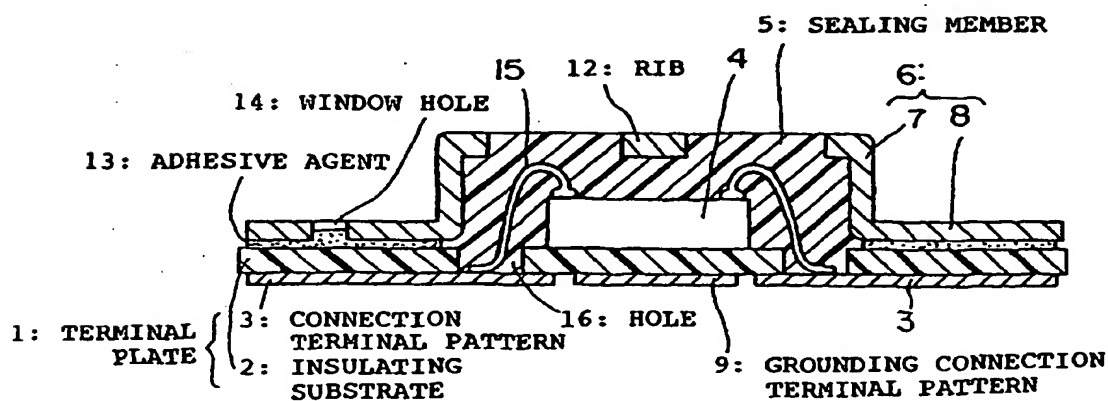
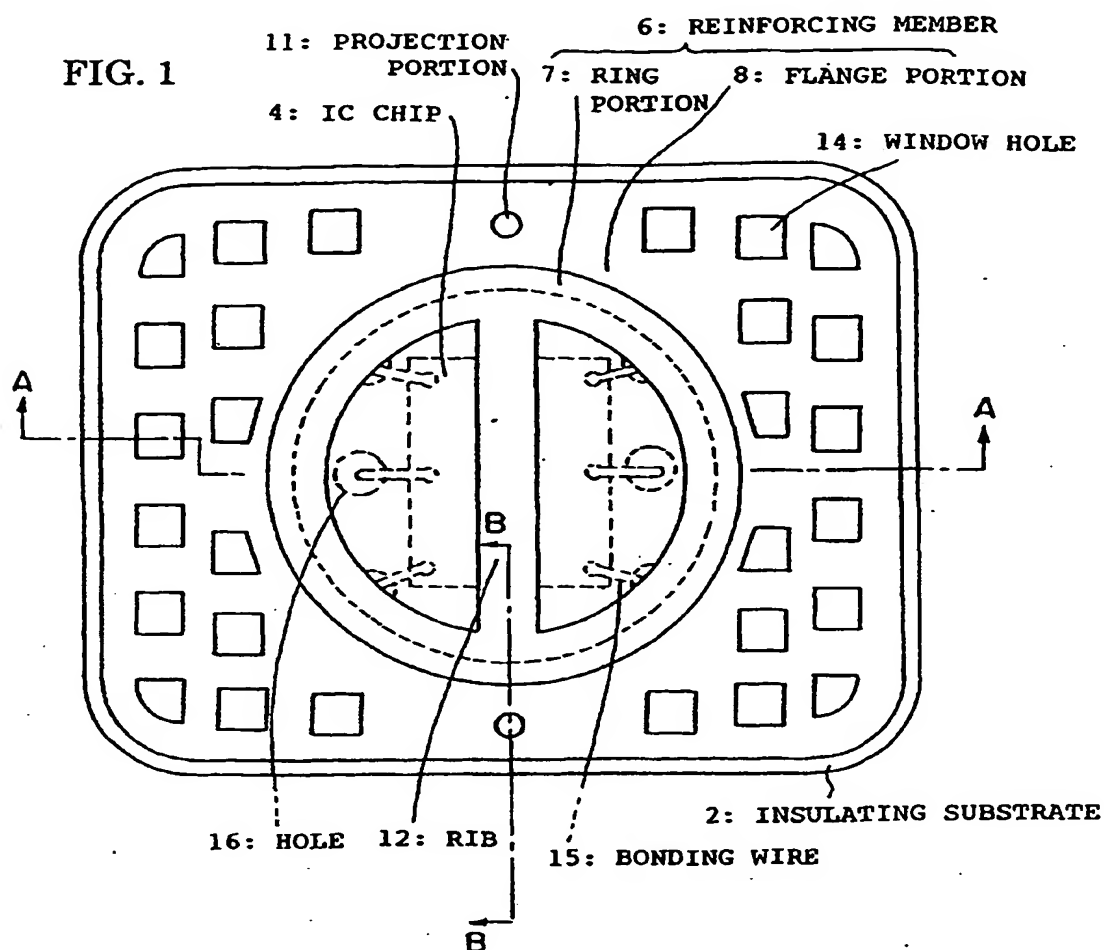
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FIG. 3

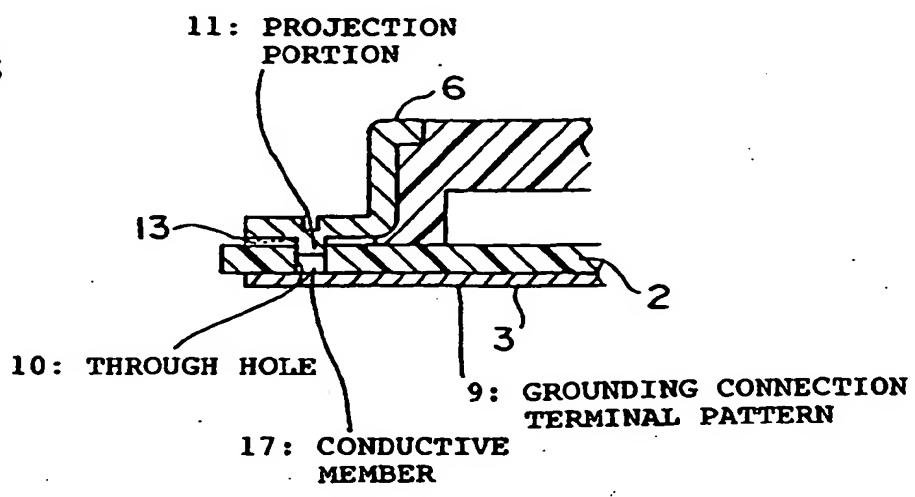
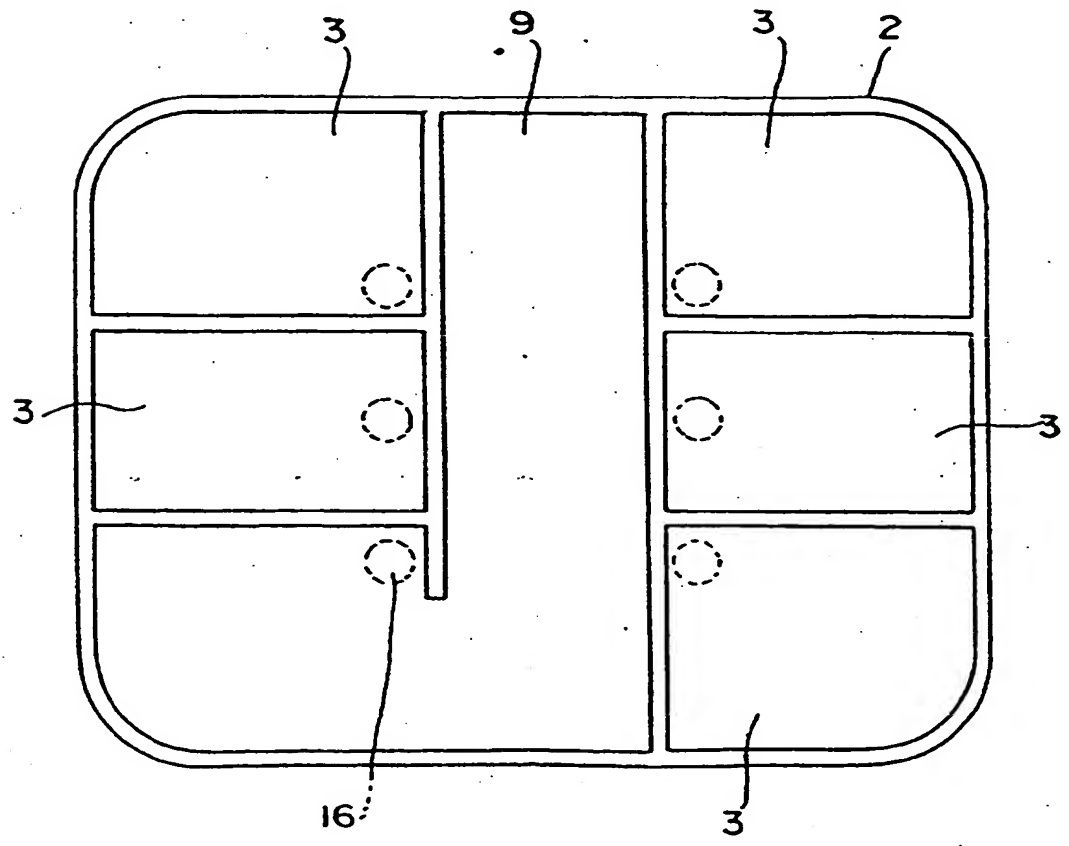


FIG. 4





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FIG. 5

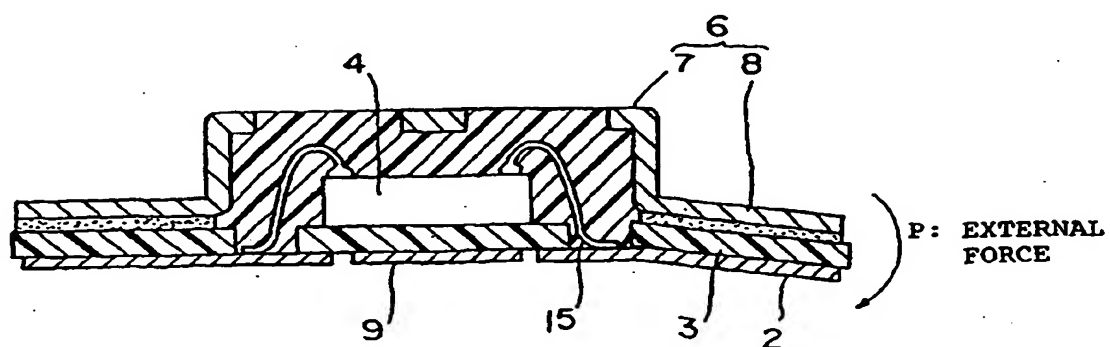
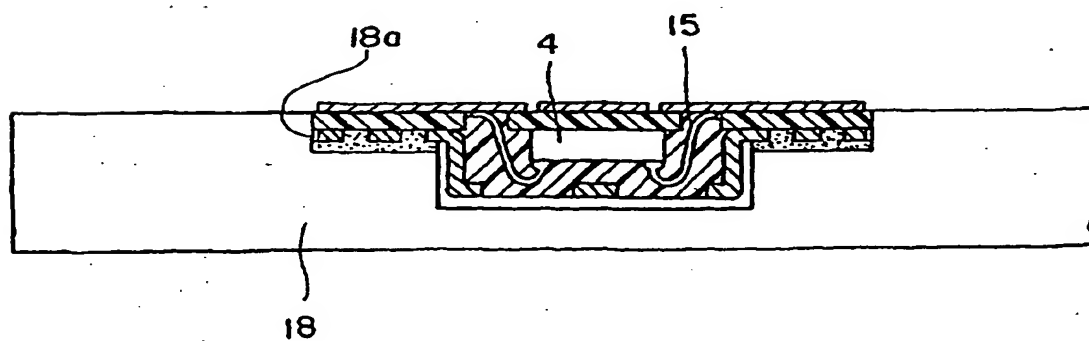


FIG. 6



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FIG. 7

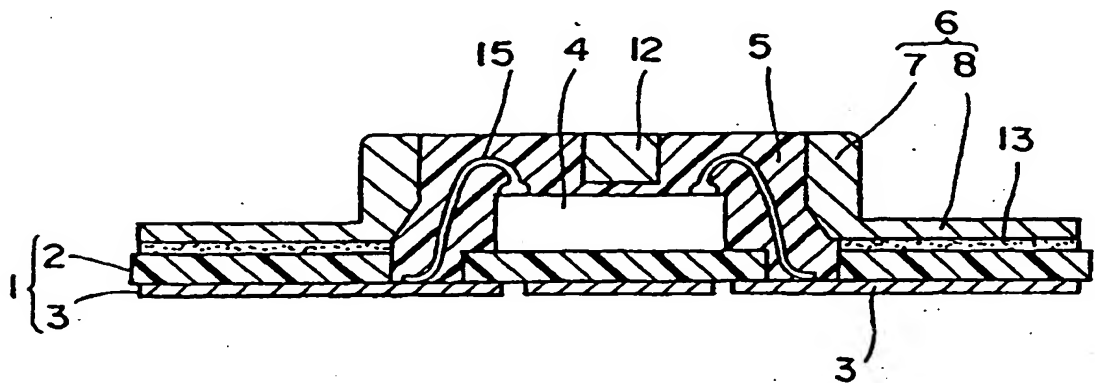
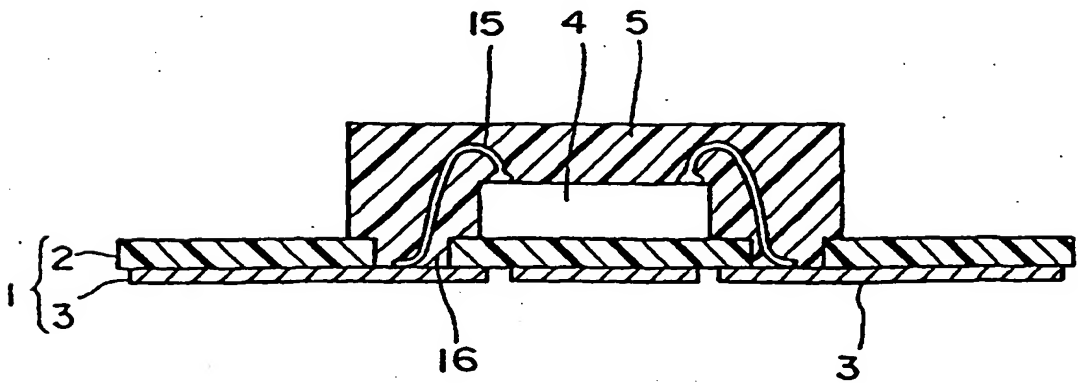


FIG. 8



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FIG. 9

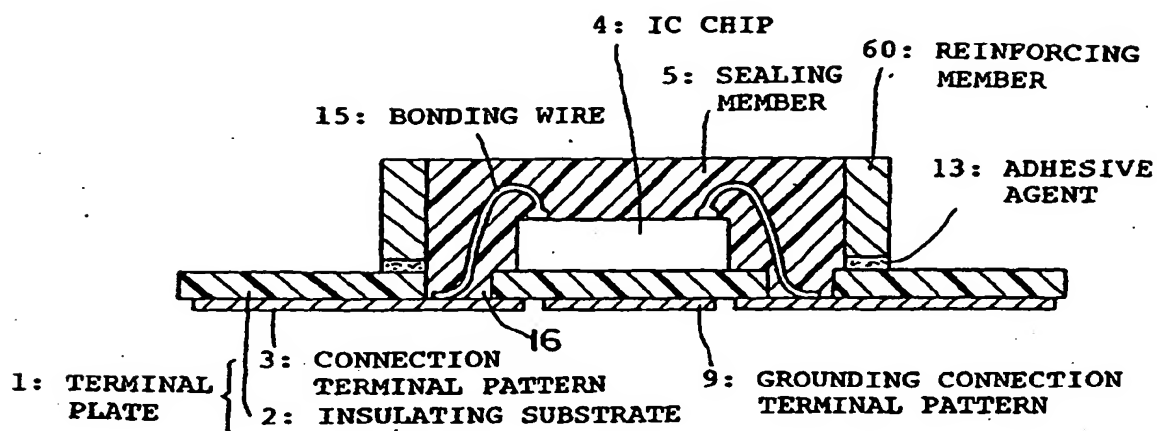


FIG. 10

